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The Effectiveness of the Commercial Driver Medical Examination in Screening for Hypertension

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Abstract

The Commercial Driver Medical Examination (CDME) is used to assess the medical fitness of a driver to safely operate a commercial motor vehicle. Hypertension is a disease that has been shown in prior research to cause reduced driving safety performance when not properly managed, and it is therefore important that medical examiners be able to consistently identify it in drivers. However, the CDME has historically been ineffective at screening drivers with safety-related diseases. For example, a report from the US Government Accountability Office showed the existence of a substantial number of drivers who were deemed eligible by the federal government for full disability benefits and yet also passed their CDME's. To address these issues, the Federal Motor Carrier Safety Administration (FMCSA) instituted the Medical Examiner Registry and mandatory training programs for examiners. This project uses data from before these reforms to establish a baseline for comparison to the new version of the CDME. We compare hypertension as captured in CDME records to hypertension as captured in medical insurance claims data on the same drivers. Our initial results indicate that of the 1,320 drivers who were determined from the insurance data to have hypertension, medical examiners were able to correctly identify 74% of them as having the condition. This suggests that while the CDME was moderately successful in screening for hypertension even before the reforms, there was room for improvement.

Data Construction

The Truckers & Turnover Project received approximately 4000 optical scans of CDME records and University of Minnesota Morris students typed the data into Excel spreadsheets. There are three ways to determine whether the medical examiner correctly identified drivers with hypertension. First, in the health history section of the CDME, the drivers self report whether they have a history of hypertension and whether they are taking medication for hypertension. Second, a blood pressure measurement is taken during the examination. Third, for drivers who are certified to drive for less time than the standard of 2 years, the medical examiner leaves a comment on why a reduced status was given, and hypertension may be noted. We used International Classification of Diseases (Ninth Revision, ICD9) diagnosis codes in the medical insurance claims data and Clinical Classification Software to determine whether the driver had a claim including a diagnosis of hypertension.

While working with CDME data that should have contained one line per driver, we found 51 drivers had two CDMEs. We first dropped exams for which the driver's certification status was missing, resulting in 6 duplicate drivers being dropped. For the remaining 45 drivers, we dropped older exams. Because the incidence of hypertension only changes between exams for less than 10 duplicate drivers, this should not have a substantive impact on the analysis results. We then merged CDME and claims data, giving us a dataset containing 3,073 drivers who have both CDME and medical insurance records. Finally, we rolled up the medical insurance data, which comes in the form of multiple lines per claim, to one line per driver, including ICD9 diagnosis codes.

Methods

We analyzed the data by comparing the incidence of hypertension as captured in the CDME to the incidence as captured in medical insurance claims for the same drivers. During the period that our data come from, hypertension was defined as persistently having systolic blood pressure ≥ 140 or diastolic blood pressure ≥ 90.

Using our indicators of hypertension in the CDME and medical insurance claims, we calculated the sensitivity, specificity, positive predictive value, and negative predictive value of the CDME for screening for hypertension. These four statistics are defined as:

- Sensitivity: percent of actual positives identified;
- Specificity: percent of actual negatives identified;
- Positive predictive value: given a positive screening, the percent chance the screening is correct;
- Negative predictive value: given a negative screening, the percent chance the screening is correct.

In addition, we repeated the analysis while examining the certification status of drivers who were identified as having hypertension in the CDME; drivers may be certified for up to 2 years, but examiners may give a reduced certification period to drivers whose health does not preclude safe driving but requires close monitoring. Thus, we analyze not only how often hypertension is caught in the CDME, but how often medical examiners take action to make sure drivers with the condition remain fit to drive.

Results and Discussion

Table 1: Incidence of Hypertension in CDME and Medical Records

CDME Screening	N	Medical Claims data	
		Positive	Negative
Positive	1,268	979	289
Negative	1,805	341	1,464
Total	3,073	1,320	1,753

Table 1 shows that the number of positives in the medical claims data (1,320) is only slightly larger than the number of positives in the CDME (1,268), suggesting that the CDME is at least moderately effective at screening for hypertension.

This is confirmed by the results in Table 2. Sensitivity is the probability that the CDME screening will be positive *given* that the driver has the disease. Of the 1,320 drivers who were indicated to have hypertension in the claims data, 979 were identified in the CDME, resulting in a sensitivity of 74%. This provides evidence that the CDME is able to screen for hypertension with moderate success.

Table 2: Sensitivity, Specificity, Positive Predictive Value, and Negative Predictive Value

	W/O Certification status	W/ Certification status
Sensitivity	74%	71%
Specificity	84%	90%
Positive Predictive Value	77%	83%
Negative Predictive Value	81%	81%

Positive predictive value is the probability the driver has the disease given the CDME screening is positive. The positive predictive value is 77%. This value may be lower than what one would expect; however, we speculate that there are two reasons why this is substantially below 100%: (1) a substantial portion of drivers who have hypertension don't have a hypertension-related medical insurance claim, and (2) a driver's blood pressure may rise above its typical level during the CDME.

When we repeat the analysis while examining whether drivers who are identified as having hypertension in the CDME are given a reduced certification status, we expect that the sensitivity will fall since both identifying that the driver has hypertension and giving the driver a reduced certification status is a more stringent standard. However, the sensitivity falls only slightly, from 74% to 71%, suggesting that when examiners are aware that the driver has hypertension, they almost always require more frequent monitoring of the driver's health.

Conclusions

Both the FMCSA and the Medical Review Board have recommended screening for hypertension as a safety-related medical disease during the CDME, but the CDME has historically been relatively ineffective at screening drivers with safety-related diseases. However, our findings suggest that the CDME was moderately successful in screening for hypertension even before the FMCSA's reforms, although there is room for improvement.

Future research is needed to examine the effectiveness of the CDME in screening for hypertension after the initiation of the new Medical Examiner Registry. The results of this study serve as a benchmark for future work of this type.

Further studies of this nature are needed. The screening effectiveness of the CDME may vary across medical conditions, and it is important for the safety of the public highways that examiners appropriately identify and certify drivers based on their actual medical fitness to operate commercial motor vehicles.

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